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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: C.5.1

United States of America

ANIMAL HEALTH AND NUTRITION

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Ames, Iowa

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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ANIMAL HEALTH AND NUTRITION

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1. In general the less developed areas of the world have climates and rainfall which combine to produce a lush vegetation. Abundant food for herbivorous animals exist but the potentialities for livestock raising is far from realized largely because of the ravages of diseases and parasites. Because of these, livestock are difficult to raise and animals that survive often are unthrifty and unproductive.

2. The raising of more and better livestock would tremendously benefit the peoples of these regions. Human malnutrition is almost universal since most of the people are forced to subsist on a diet consisting largely of starches and sugars with too little protein. Most of the protein is derived from plants and this is generally lacking in some of the amino acids that are necessary for human health and vigor Meat, milk, and eggs contain the factors that are now missing and are so sorely needed.

3. Reservoirs of a large number of destructive animal diseases are in the less developed regions of the world. The control and elimination of these diseases would not only provide an improved diet and better health for the people of these regions but it would open up export markets for animals and animal products in other areas by removing some of the causes of trade restrictions and embargoes that now exist.

4. Scientific and technical means of controlling most of these diseases are now available. The problem is in finding ways of applying them effectively in the under developed countries. The first requisite is the development of governmental policy to establish adequate veterinary services, the second is to find trained personnel to direct the effort. Generally, adequately trained veterinarians in these regions are too few. In most of the African continent south of the Sahara Desert, excepting the Republic of South Africa, they are almost non-existent. Other areas have a few veterinarians but for financial or other reasons they are not adequately organized and supported to be effective.

5. Improvement in animal disease control in the less developed regions will involve:

(a) The employment of qualified veterinary technicians from abroad for training and supervision of control programs, when sufficient nationals are not available.

(b) The sending of young citizens of these countries abroad for training and supervision of control programs, when sufficient nationals are not available.

(c) The establishment of veterinary schools in these regions, either on a national or on a regional basis. If a country has an annual need for 25 or more veterinarians, it should explore the possibility of forming its own school; if the needs are less, it may be best to pool its resources with its neighbors to develop a regional school.

6. In many instances, all three approaches probably will have to be employed in the beginning. In both Africa and Asia new veterinary colleges are being established which merit assistance.

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Agenda Item: C.8.1

United States of America

IMPROVEMENT OF PRODUCTION AND PRESERVATION METHODS IN AN UNDERDEVELOPED FISHERY THROUGH UPGRADING FISHING VESSELS, GEAR AND SANITARY PROCEDURES

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IMPROVEMENT OF PRODUCTION AND PRESERVATION METHODS IN AN UNDERDEVELOPED FISHERY THROUGH UPGRADING FISHING VESSELS, GEAR AND SANITARY PROCEDURES

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INTRODUCTION

1. Acre for acre, the seas are potentially as productive as arable land, but only about one percent of the food consumed by man is derived from the oceans. Estimates place the potential sustained annual yield of the seas at around 500 billion pounds,but only about 16 percent of this potential now is harvested. More important, of the world's harvest of 32 million metric tons of fish in 1958, not over 5 or 6 million metric tons were taken by the less developed nations. While millions of people in such nations suffer the wasting of tissue and the failure of growth associated with the often fatal protein deficiency diseases, just off-shore lie vast resources of animal protein, self-reproducing and almost wholly unexploited.

2. This industrial and nutritional imbalance in the use of the world's fishery resources and in the diets of its people can be redressed. It will require high priority national programs, developed with the assistance of experts, and courageously implemented over a period of years, to provide the skills and supporting facilities necessary to the operation of a sophisticated deep-water fishery. Fishery programs designed to supply either domestic food requirements or the capital necessary for industrialization must visualize the entire fishing industry and its supporting services as a unit. The harvesting of fish, its delivery to port, its processing and ultimate delivery to the consumer, domestic or foreign, must be considered as an integrated system, having one major objective: the feeding of man from a wisely managed,self-reproducing resource. The need for many supporting skills and services, from net-mending, engine repair and vessel construction to processing facilities and distribution systems, must be foreseen. The initial support facilities should be provided at a level of development consistent with the technological awareness of the nation and its contemporary fishing industry. Plans should provide for a systematic upgrading of these skills and facilities as market demands for fish increase in size and complexity.

3. A clear understanding of the relative priorities of the national needs, whether protein food for the domestic population or procurement of capital for industrialization through export of fisheries products, must underlie the national fisheries program. The latter goal is most easily and rapidly reached through contractual agreements with industry representatives of the advanced fishing nations, whereby the entire harvesting, processing and distribution system is planned, developed and operated for the sole purpose of exportation of its products at a profit to industry and to the state. Such systems have been developed

for the new tuna fisheries of Ghana and of the Ivory Coast. This paper, however, concerns itself with the plans of a nation determined to use its off-shore resources primarily as a source of food for its own population and then gradually to achieve export nation status as a natural consequence of this internal growth. The paper will consider a hypothetical, non-industrialized, coastal nation--to which a wide variety of marine resources are available for exploitation. These resources would include demersal (bottom-living) fish, pelagic (surface-swimming) fish and shellfish.

4. The initial level of development of a planned food fish delivery system must be based upon knowledge of the distribution and movements of the fishery resource, on the availability of trained man-power, processing and distribution systems, on consumer demand for the products and on the domestic availability of investment funds. The appropriateness of one or more of the many different types of fishing gear is contingent upon these considerations.

IMPROVED PRODUCTION METHODS

5. Methods that may be considered for improving fish harvest include (1) increasing the efficiency of existing gear by better design and materials, (2) increasing the effective range of craft through incorporating power into vessels, (3) introducing new types of fishing gear which are more effective for harvesting now untapped resources, (4) increasing catch through better fishing tactics, and (5) increasing the number of units employed.

6. In the initial stage of development, let us assume that the nation involved has little more than canoes or other small craft to conduct fishing operations, that capital for investment is small, and that shore facilities for maintenance of larger craft are practically non-existent. In a situation of this sort it is important not to upgrade the methods and craft more rapidly than the other equally important facilities are improved. Thus, simplicity in gear, vessel and deck machinery in the initial stage is important.

7. We would recommend for the first five years of development: (1) That existing gear used to harvest fishes be upgraded through better design and the use of better materials. (2) That fishermen be educated in the best specialized use and tactics for gear with which they are familiar. Employment of a fishing expert familiar with many types of gear would be advisable during this phase, to educate the fishermen in the care and use of these and of the more sophisticated gear to be introduced in the second phase of the program. (3) That all possible efforts be made to increase the number of vessels in the fishery to a point limited only by the demand for their products. (4) That gear for gathering marine animals which remain more or less fixed in their environment, such as oysters, clams, and abalone, be introduced. Simple devices would include shovels, tongs, and rakes. The simple dredge which is effective for harvesting oysters or scallops also could be employed. (5) That the smaller round-haul type nets such as the lampara, purse seine, or ring net, be employed from existing small craft. The lampara nets similar to those used in the California bait catching operations for tuna can be operated from small vessels or open boats and handled manually, and yet they are relatively effective in harvesting the smaller school fishes. Gill nets currently are used in most of the world and represent an effective and simple device for harvesting both fresh-water and marine fish. Some increase in efficiency in this type of gear may be achieved through improvement of materials and use of mesh sizes appropriate to local stocks.

8. In the middle part of the first five-year phase small outboard engines could be introduced. Initially these should be of rugged and simple design to preclude the repeated failures and to eliminate the bulk of the more complicated types.

Fuel tanks, remote starting, remote control, reversible propellers are not necessary for this phase of the program.

9. Within this same period concurrent training in basic skills and services and in the operation and maintenance of larger craft (inboard engines, net-fabrication and principles of navigation and seamanship) should be initiated. The number of fishermen and repair men brought under such training need not be large, but if the program is to be effective, attempts should be made to include talented persons who could pass on their knowledge to their fellow workers.

10. Eventually, as progress is made in processing, marketing and transportation, in development of shore facilities, and as general economic development in the country warrants, the program should be expanded to include more sophisticated fisheries operations. In our hypothetical example exploitation of latent marine resources would require development of craft suitable to operate in offshore waters. Such craft need not be large or complicated, but should be seaworthy, and the engines, the Swedish semi-diesel for example, should be simple and dependable with a minimum of moving parts. The development of inboard small craft which could operate several days at sea would require the additional skills in seamanship, maintenance, and construction. Availability of such craft and skills would be the first step in bringing a large variety of marine resources within reach of the coastal nation.

11. Expansion of fishing out over the continental shelf to exploit demersal and pelagic fishes and shellfishes would require modification of the simple nets used hitherto. The introduction of the specialized net called the otter trawl or of the similar two-boat trawl should be considered in this phase. Trawl nets need not be as large as those used in North Atlantic fisheries; they can be sized to the capacity of the vessels available.

12. In the initial stage utmost simplicity is suggested in deck layouts designed to handle trawl cables and in the types of winches to be employed. Obviously, some trawling in the shallower waters can be accomplished even without the use of winches. The construction of trawls is simple, and although they vary in complexity throughout the world, a common design theme prevails. Use of trawls does not require extensive training, and the skills of local fisherman could quickly be adapted to their use.

13. Further development in the coastal fisheries would be geared to more advanced use of longline gear, both pelagic and ground gear, and to systematic gillnetting or driftnetting in coastal waters. With both types, some mechanization of handling would be desirable but is not essential. The training of fishermen should now be expanded to include visits to foreign areas where operation of craft similar to those being introduced could be observed. This would provide the fishermen with an understanding of the diversification and mechanization possible in fisheries. It would, in the long run, enhance their capabilities to bring about maximum exploitation of their coastal waters.

14. It should not be overlooked that the most effective means of bulk production of pelagic fish has been through the use of purse seines or other round-haul nets. Consequently, during the latter phases of development, the skills, knowledge, and actual use of modern gears of this type must be mastered. The introduction to active fishing with these nets need not be with large complicated gear such as are used in the California tuna seine fisheries. A wide variety of smaller encircling nets is available. The introduction and use of encircling gear will provide the basic training in fishing tactics for the harvesting of schooling fishes such as herring, mackerel, cod, hake, etc.

15. If all phases of the fisheries (production, processing, and distribution) advance in a coordinated manner, and the program achieves some success, then sufficient capital may well have accured to initiate ocean fishery activities. These would involve large complex craft such as the modern tuna seiner, tuna longliners, or distant-water trawlers. Operation of vessels and gear of this type would require highly developed seamanship and fishing tactics, and skilled operation of vessel machinery, including refrigeration installations. Because ocean fishing involves distant-water operations and considerable knowledge of mechanics and electronic devices, one might expect that expansion into these more complex operations would go beyond the humanitarian aspect of providing protein for the nation involved, to the aspect of providing raw material for export in the world markets.

16. Construction and design of gear probably would not be a major problem, as skills in their operation would have been gained through operating similar units of a smaller size. The advance into the more complex fisheries, however, will require greater assistance from outside technicians than any other phase. This is essentially the period when the local fishermen must master the problems involved in mechanization and the logistics of large vessel operations and when processors must master the most complex problems of world-wide distribution of their products.

17. During this phase the basic vessel design should be given considerable thought, with emphasis on such factors as geographical operating ranges; species to be sought; flexibility of use (multipurpose vessels); refrigeration requirements; and the possibilities of fleet-operated factory vessels. This kind of planning requires a degree of fishing sophistication comparable to that of the advanced fishing nations of the world. The new fisheries, however, need not develop to this degree to be satisfactory. Extremely successful small-boat operations of a local nature may be achieved, and with these, a considerable portion of the protein needs of the nation can be supplied.

IMPROVEMENTS IN PRESERVATION METHODS AND SANITARY PROCEDURES

18. In developing a schedule by which the latent fishery resources of a small coastal nation can best be developed and utilized for the benefit of the people of that nation, it must again be remembered that any increases in the processing and distribution of fish must be coordinated with other aspects of the nation's overall economic improvement effort. If the nation has a wide variety of fish and shellfish available for local exploitation by small boats, the processing problems during the initial five year period may be expected to be associated with maintaining the quality of the fresh fish on the vessel and during delivery to the market place. Two principal factors, time and temperature, are always involved in the spoilage of fresh fish. In the less developed fishing countries of the world, only one of these factors can be controlled practically. This factor is the duration of time the fish are held before being delivered to processors. If both supplies of ice and the facilities to store and use ice on the fishing boats during the initial period are lacking, there is little hope of controlling the second factor by reducing temperature of fresh-caught fish.

19. Sanitation and improvement of quality will require: (1) evisceration of the fish at sea, (2) rinsing of the fish with salt water and (3) the use of wet canvas, spread over the freshly caught fish in the bottom of open boats to protect the fish from the hot drying effects of the sun. It is vital that at first fish should be taken as close to shore as possible so that they can be handled quickly.

20. The lack of adequate marketing and distribution techniques is the basic

obstacle encountered when a fishery has developed sufficiently, through the use of outboards or improved vessels, to supply more fish than is demanded by the consumers in the immediate neighborhood of the fishing port. Retail facilities generally consist of an itinerant peddler, or at best, of a small makeshift store, usually in unsanitary surroundings. Early attention should be given to construction of simple covered structures, consisting of from 80 to 100 stalls. Such structures, costing approximately U. S. $10,000, would provide retailers, including those handling fishery products,with clean, organized facilities. Each structure should have an adequate water supply, counter space, roof protection, concrete floors and toilet accomodations. Maintenance of sanitation should be enforced through periodic inspections by regulatory officials. Such structures would form the base for a local retail market and for the distribution of the product into the hinterlands. Screened or closed trucks or motor launches, also inspected periodically for sanitation procedures, would serve to transport products from the markets to consumers in the surrounding countryside. As soon as it is technologically feasible, fish must be iced down, both in the market and throughout the distribution system.

21. More complex systems for distribution of fish to increasingly distant markets cannot be accomplished by utilizing strictly fresh fish without refrigeration, as may be done in the seaport area. Therefore, beginning with the sixth year, product preservation through drying, smoking, and salting techniques must be undertaken on a commercial scale in coastal processing plants. The simplest preservation techniques, such as sun drying, should be dveloped as a commercial enterprise first since they require little or no fuel or chemicals. As fish supplies increase, and the economic situation improves, it will be possible to process fish meal and smoked fish and salted fish for shipment to the hinterlands.

22. Although many of these fish preservation techniques may now be known and in use on a small scale, considerable training and effort will be necessary to adapt them to a commercial processing plant stage. Structures capable of handling several tons of fish per day must be built. Large commercial supplies of fish and salt must be obtained. Practical information about inventory control and sanitation techniques for small plants must be imparted to local workers through training courses in order to step these operations up from the customary family level of effort to the commercial level. To assist in this transformation, it is recommended that technical experts from developed countries be brought in to demonstrate to the local operators the fundamental principles of these processes. This can best be done by constructing demonstration processing plants and employing selected personnel to operate the plants on a training basis under the guidance of the visiting experts. These trainees would be encouraged to apply this knowledge by building and operating similar plants in other regions.

23. As these small plants are established and become productive, and as supplies of fish are increased through the use of more efficient catching equipment such as fishing trawlers, the construction of fish canning and freezing factories should begin. In training of personnel to operate these factories, experts can again be brought in from developed countries and local plant managers can be sent abroad to study existing plant practices. The prospects for foreign investment is great at this stage because of the opportunity for developing profitable export products. But domestic markets, especially for canned fish, should also be vastly improved as local transportation and distribution channels are developed and more people become familiar with the products.

SUMMARY

24. In summary, techniques for the production and preservation of fish in emerging nations must be developed step by step. Introduction of these new techniques will take considerable time since old and established but inefficient catching, processing and marketing methods must be replaced with new and improved methods.

Consideration must first be given to simple improvements such as the increased use of outboard motors and more efficient methods of salting and drying of fish. Later, as other segments of the national economy are improved, additional changes such as the use of motorized trawlers and the construction of fish canning and freezing plants can be considered. At this point, exports of more valuable products such as shrimp and lobsters can provide a significant boost to the economy of the nation.

25. Ideally, the first phase (five years) of a national program for industrial development of the fisheries should include, as a minimum, the following steps:

(a) Improving existing fishing gear through better design and use of better materials.

(b) Educating fishermen in best uses and tactics of contemporary fishing gear.

(c) Training of net-manufacturing and vessel-repair teams and of other supporting services.

(d) Obtaining, by charter, an exploratory deep-water fishing vessel of advanced design to develop an inventory of domestic marine resources, the ship to be operated by foreign nationals.

(e) Planning for construction of shore facilities for processing and distribution of products of 2nd phase of fisheries program.

(f) Training of cadres in outboard motor maintenance and in transom-stern boat construction.

(g) Educating fishermen in primitive preservation and sanitation techniques for use on existing vessels and products.

(h) Training of the most promising young men for administration of the 2nd phase fisheries, with the help of fisheries colleges and government laboratories of advanced fishing nations.

(i) Developing sources of international assistance in financing 2nd phase plant and vessel construction and in procurement of processing and distribution equipment.

26. A general plan as suggested here may provide one key to successful development of a fishing industry. Obviously, the actual course of events of fisheries development in a nation cannot follow any standard pattern, and the technical advisors must adapt their programs to local customs, sources of material, existing economic situations, and even political factors. In any event, the upgrading of fishing techniques should be paralleled by improvements in processing and distribution facilities. The success of such a program would depend on the capacity and quality of the technicians involved and on the national effort expended rather than on the specific suggested scheme of attack.

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